



Jerome W.

HANNIGAN and ASSOCIATES, INC.

Land Planning • Land Surveying • Land Development Consulting

Date: March 01, 2018

Rev 06-09-18

Job Number: 16-027

HUDSON MINOR SUBDIVISION MODIFIED GEOLOGY & SOILS REPORT

Hudson Minor Subdivision is a proposed four lot subdivision of a 38.00 acre parcel located in the northeast portion of the County. The property has a small home, well and septic system located in the north half on what is proposed to be the 5.73 acre, Lot 3. Currently under construction is a second larger home with an individual septic system on proposed Lot 4, which is 6.25 acres. Lot 2 is 5.59 acres and Lot 1 is 18.14 acres. The current and proposed zoning is RR-5.

The property lies at an average elevation of approximately 7350 feet. Topography is moderately sloping with a ridgeline that runs southeasterly down from the northwest property corner to the midpoint of the south line. Slopes are typically 5% to 10%. The east boundary of the property adjoins Black Forest Road. The property has historically been used as livestock grazing and has a good cover of grasses. East Cherry Creek flows northerly about 3/4 of a mile east of and perhaps 150 feet lower than the property.

Geology was investigated using commonly available published geologic data. The primary structural feature in the general area is the Rampart Range Fault which lies along the face of the Front Range about 11 miles west, marking the boundary between the Great Plains Province and the Southern Rocky Mountain Province.(1) The Alluvium of Palmer Divide (early Pleistocene or Pliocene? age); Map Symbol (QTa) is mapped over approximately 70% of the site. Deposits in this oldest alluvial category include predominantly sand deposits. The distribution and slope of these deposits suggest that they once filled an ancestral valley of East Cherry Creek. Bedrock deposits, Map Symbol (TKda5) are part of the Dawson Formation of early to middle Eocene age.(2) Additional mapping by USGS indicates simply Arkosic sandstone and claystone, Map Symbol (Td) for the site. These consist of yellowish-gray to light gray, commonly ironstained coarse to fine grained arkose and feldspathic sandstone containing numerous gray to greenish-gray clay lenses.(3)

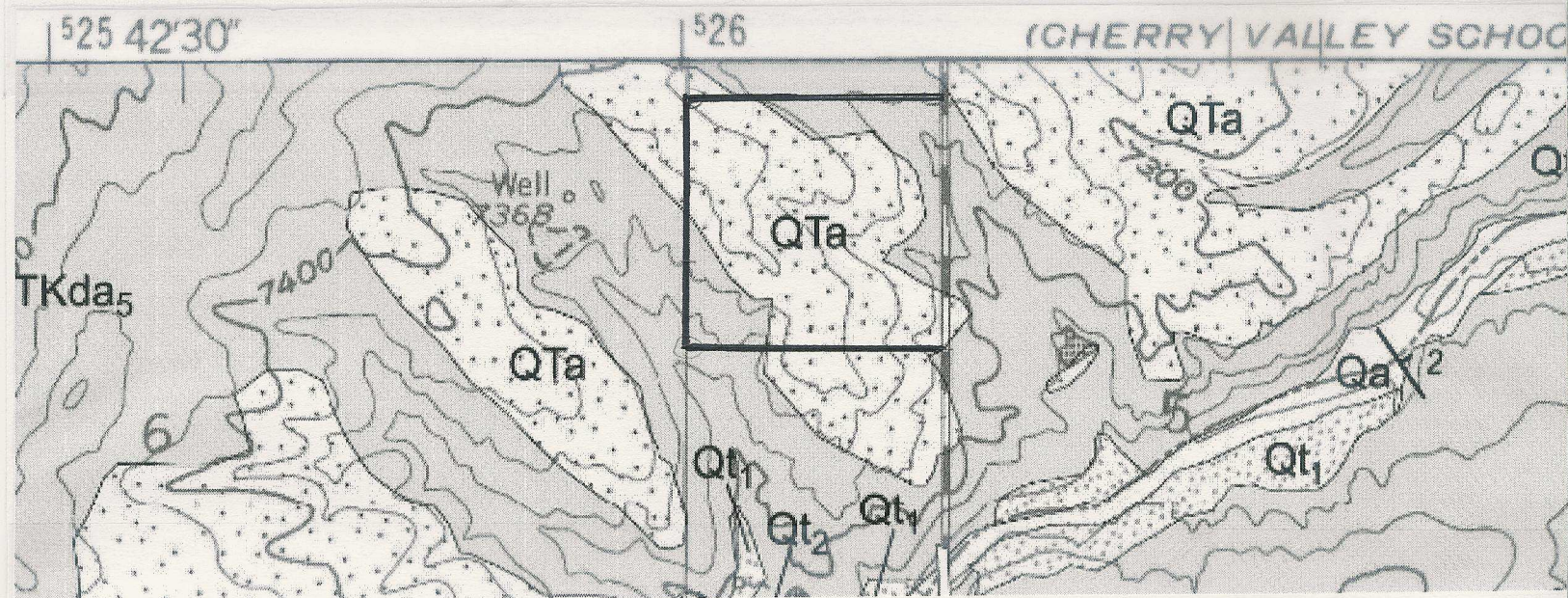
As mentioned in the Colorado Geological Survey referral response by Jonathan R. Lovekin, PG, dated April 19, 2018, "The site is not undermined, is located outside of any mapped FEMA flood hazard zones, and does not contain, nor is it exposed to any identified geologic hazards that would preclude the proposed residential use and density. However, steep slopes will limit locations of house sites." "Typical geologic and engineering constraints can include shallow hard bedrock, seasonally perched shallow groundwater, erosion, expansive soils associated with the Dawson, and, as already pointed out, steep slopes." Individual lot and homesite specific geotechnical investigations consisting of drilling, sampling, lab-testing and analysis are needed

to characterize soil and bedrock engineering properties such as density, strength, water content, and swell/consolidation potential; depths to groundwater and bedrock, verifying the feasibility of full depth basements, and to provide earthwork, foundation, floor system, surface and subsurface drainage for design purposes. This testing, completed by a Professional Geologist, is required for home and leach field design purposes on each lot prior to building permit application. Further, a note has been added to the Final Plat restricting building in areas that are sloped in excess of 30%. Published topographic information (USGS) indicates no such slopes on site but other, later, digital elevation models compiled from LIDAR imaging suggests there are such slopes associated with the existing drainages.

According to the USDA Soil Survey (Issued June 1981) this property is shown on Map Sheet No. 1 as being primarily within soil description area #67, Peyton Sandy loam, 5 to 9 percent slopes. Flanking that are Peyton-Pring Complex, 8% to 15% slopes. (Soil Descriptor #69) The location of these soil units generally align with the geologic mapping of the Alluvium of Palmer Lake being the Peyton Sandy Loam and the Dawson Formation underlying the Peyton-Pring Complex.

The Peyton Series consists of deep, well drained soils that formed in arkosic alluvium and residuum. The Pring Series formed in arkosic sandy sediment. These soils have good potential for use as homesites. The main limitations are steepness of slope, limited ability to support a load and frost action potential. Permeability of the soils is moderate. Onsite testing for both OWTS indicated percolation rates exceeding 60 minutes, requiring engineered systems. Site specific soil testing will be done for the required engineered foundation design and leach field of any new home.

Geology Map with this site outlined:



Source: *Geologic Map of the Black Forest Quadrangle* distributed by Colorado Geological Survey. Jon P. Thorson, 2003. CGS Open File Report 03-06.

Geologic Bibliography

(1): Widmann, Beth L., Compiler, 1997, *Preliminary Quaternary Fault and Fold Map*, Colorado Geological Survey Open File Report 98-08

(2): Thorson, Jon P. 2003. *Geologic Map of the Black Forest Quadrangle, El Paso County, Colorado*. Colorado Geological Survey. Open File Report 03-06.

(3): Bryant, Bruce; McGrew, Laura W.; and Wabus, Reinhard A. 1981. *Geologic Structure Map of the Denver 1 degree x 2 degree Quadrangle, North-Central Colorado*. U.S. Geological Survey. Map 1-1163.

Quotes and additional references taken from that referral letter authored by Jonathan R. Lovekin, P.G., Senior Engineering Geologist at Colorado Geological Survey, dated April 19, 2018 and a part of the project file.

USDA National Cooperative Soil Survey

Soil Descriptions

United States Department of Agriculture
Soil Conservation Service
Soil Survey of El Paso County Area, Colorado. 1981

United States Department of Agriculture
Natural Resource Conservation Service
Web Soil Survey, 2016

United States Department of Agriculture
Soil Conservation Service
Soil Survey of El Paso County Area, Colorado. 1981

67—Peyton sandy loam, 5 to 9 percent slopes. This deep, noncalcareous, well drained soil formed in alluvium and residuum derived from weathered arkosic sedimentary rock on uplands. Elevation ranges from 6,800 to 7,600 feet.

Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Holderness loam, 5 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes.

Permeability of this soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. Gullies and rills are common.

Most of the acreage of this Peyton soil is used as rangeland. Some areas are used for wheat and oats. Stubble mulching or other crop residue management practices are needed to control water erosion. Wildlife habitat is also an important use.

This soil is well suited to the production of native vegetation suitable for grazing. The native vegetation is mainly mountain muhly, bluestem, mountain brome, needle-and-thread, and blue grama. This soil is subject to invasion by Kentucky bluegrass and Gambel oak. Minor amounts of forbs such as hairy goldenrod, geranium, milk-vetch, low larkspur, fringed sage, and buckwheat are in the stand.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush, sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. The main limitation is the limited ability to support a load and potential frost action. Buildings and roads can be designed to overcome these limitations. Capability subclass IVe.

69—Peyton-Pring complex, 8 to 15 percent slopes.

These gently to moderately sloping soils are on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Peyton soil makes up about 40 percent of the complex, the Pring soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Holderness loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; Kettle gravelly loamy sand, 8 to 40 percent slopes; and a few areas of Rock outcrop.

The Peyton soil is commonly on the less sloping part of the landscape. It is deep, noncalcareous, and well drained. It formed in alluvium and residuum derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches or more.

Permeability of the Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The Pring soil is deep, noncalcareous, and well drained. It formed in sandy sediment derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The soils in this complex are used as rangeland, for wildlife habitat, and for homesites.

These soils are well suited to the production of native vegetation suitable for grazing. The dominant native species are mountain muhly, bluestem grasses, needle-andthread, and blue grama. These soils are subject to invasion of Kentucky bluegrass and Gambel oak. Common forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are well suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have good potential for use as homesites. The main limitations are steepness of slope, limited ability to support a load, and frost-action potential. Buildings and roads can be designed to overcome these limitations. These soils also require special site or building designs because of the slope. Access roads should have adequate cut-slope grade, and drains should be provided to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

Report — Map Unit Description

El Paso County Area, Colorado

67—Peyton sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369d

Elevation: 6,800 to 7,600 feet

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 115 to 125 days

Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam

Bt - 12 to 25 inches: sandy clay loam

BC - 25 to 35 inches: sandy loam

C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Medium

*Capacity of the most limiting layer to transmit water (Ksat):
Moderately high (0.20 to 0.60 in/hr)*

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Sandy Divide (R049BY216CO)

Hydric soil rating: No

Minor Components**Other soils**

Percent of map unit:

Hydric soil rating: No

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes

Report — Map Unit Description

El Paso County Area, Colorado

69—Peyton-Pring complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 369g

Elevation: 6,800 to 7,600 feet

Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent

Pring and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam

Bt - 12 to 25 inches: sandy clay loam

BC - 25 to 35 inches: sandy clay loam

C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 8 to 9 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Medium

*Capacity of the most limiting layer to transmit water (Ksat):
Moderately high (0.20 to 0.60 in/hr)*

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Sandy Divide (R049BY216C0)

Hydric soil rating: No

Description of Pring**Setting**

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic alluvium derived from sedimentary r

Typical profile

A - 0 to 14 inches: coarse sandy loam

C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat)
(2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: Loamy Park (R049BY222C0)

Hydric soil rating: No

Minor Components**Other soils**

Percent of map unit:

Hydric soil rating: No

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes